

Effects of Sentence Instruction and Frequency Building to a Performance Criterion on Elementary-Aged Students with Behavioral Concerns and EBD

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Elementary-aged students with behavioral concerns and disabilities struggling to construct sentences stand a high likelihood for continued academic difficulty. Several studies have used sentence instruction with picture-word prompts to improve sentence level writing skills, including construction of simple sentences, syntax, capitalization, and punctuation. Research in other academic areas, such as mathematics and reading, have found students benefited from deliberate practice procedures resulting in fluency. The present study combined sentence instruction with a practice procedure and measured its impact on the writing performance of four elementary-aged students with behavioral concerns and disabilities. The study used a single case experimental design. The intervention produced gains in the frequency of simple sentences constructed and other sentence level writing skills.

Educators and local and state governing agencies expect students to develop an increasingly complex repertoire of writing skills (Common Core State Standards, 2010). Regrettably, students with behavioral concerns, including students with emotional and behavioral disorders (EBD), tend to show sustained difficulty developing adequate writing skills (Brier, 1995; Scruggs & Mastropieri, 1986; Trout, Nordness, Pierce, & Epstein, 2003). Students with behavioral concerns tend to show consistently low, stagnant writing performance, not improving or

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declining across grade levels (Reid, Gonzalez, Nordness, Trout, & Epstein, 2004). The situation is worse for students with externalizing behavior problems who tend to show lower writing performance compared to students with internalizing behavior concerns (Nelson, Benner, Lane, & Smith, 2004).

Prior studies focusing on students with writing difficulty (Berninger et al., 2002, 2006) suggested that intervention during elementary school years can improve writing development and prevent continued difficulty. Following a certain level of proficiency with handwriting and spelling, elementary-aged writers need to construct simple sentences. The skills-based approach (Datchuk & Kubina, 2013; Kammenui & Simmons, 1990) proposes that intervening on simple sentence construction of struggling writers concurrently improves the amount of complete sentences and several sentence-level writing skills such as amount of words with correct syntax, capitalization, and punctuation.

Prior Sentence Construction Studies

Recent studies (Saddler, Asaro, & Behforooz, 2008; Saddler, Behforooz, & Asaro, 2008; Saddler & Graham, 2005) examined effects of instruction of complicated sentence constructions, such as compound sentences or sentences with adjectives, but fewer studies have investigated instruction of simple sentences for elementary-aged students with disabilities and behavioral concerns (Datchuk & Kubina, 2013). To efficiently teach simple sentence construction, several studies have successfully used sentence instruction (SI) with picture-word prompts. Many SI with picture-word prompts interventions occur as part of multicomponent interventions aimed at teaching simple sentence construction and other sentence-level writing skills for students with disabilities in elementary grades (Anderson & Keel, 2002) and middle/high school grades (Viel-Ruma, Houchins, Jolivette, Fredrick, & Gama, 2010; Walker, Shippen, Alberto, Houchins, & Cihak, 2005).

SI with picture-word prompts feature pictures of items (people, animals, and/or things) engaged in an action with words that correspond to the pictures. An example might show a picture of a small dog digging a hole with the words “dog” and “dirt.” Writers then use the word prompts to construct a simple sentence describing the picture. Picture-word prompts theoretically ease task demands of traditional, simple sentence construction by replacing content generation (i.e., the subject and action of a sentence) with picture description and word arrangement (Datchuk & Kubina, 2013; Kammenui & Simmons, 1990).

Benefits of Fluency in Writing

Besides instructional procedures to improve construction of simple sentences, the importance of deliberate practice procedures to impart fluency has gained prominence as an important outcome. Researchers have reported fluency in multiple sentence-level and paragraph-level skills (Datchuk & Kubina, 2013; Graham et al., 2012; Mason & Kubina, 2011; Mason, Kubina, Valasa, & Cramer, 2010) contribute to continued and robust development of writing skills. For example, fluent handwriting promotes writing output and potentially increases the quantity and quality of composition (Abbott, Berninger, & Fayol, 2010; Berninger et al., 1992; Berninger, Cartwright, Yates, Swanson, & Abbott, 1994; Graham, Berninger, Abbott, Abbott, & Whitaker, 1997).

Research conducted with writing fluency stems from two different pedagogical approaches: cognitive with strategy instruction, and behavioral using Precision Teaching (Mason & Kubina, 2011). Both approaches value the outcomes of fluency and appear complimentary to one another. In the behavioral fluency literature, for instance, fluency is defined as the end product of a behavior reaching a level of accurate and fast performance (Binder, 1996; Kubina & Morrison, 2000; Kubina & Yurich, 2012). Achieving behavioral fluency results in several benefits including the immediate improvement and maintenance of performance across time with little to no decrement in frequency or accuracy (Binder, 1996, 2005; Johnson & Layng, 1992).

The emergence of fluency in both the behavioral and cognitive literatures offers many opportunities to examine socially significant, relevant writing behaviors. At the time of this writing, we could find no study investigating the effects of achieving fluency on simple sentence construction. Specifically, fluency in simple sentence construction should result in an increase in simple sentences and words with correct syntax, maintaining across time (Datchuk & Kubina, 2013; Kammenui & Simmons, 1990).

Frequency Building to a Performance Criterion

To achieve fluency, researchers have typically used explicit, or deliberate practice procedures more precisely defined in the behavioral fluency literature as frequency building to a performance criterion (FBPC). FBPC has several components (Kubina & Yurich, 2012). The total time allotted for practice is segmented into timed trials. For example, a total of five minutes of practice time can be segmented into five, one-minute timed trials. Following each timed trial, the performer receives feedback and error correction from a teacher or partner. The timed trials build to a performance criterion or goal. A performance criterion can derive from local samples of performance or nationally representative samples (Johnson & Street, 2004; Koorland, Keel, & Ueberhorst, 1990; Kubina & Yurich, 2012). A performance criterion promotes instructional decision making by allowing comparison of a student's individual performance to a goal and increases efficiency of intervention by providing a clear stopping point (Kubina, 2005).

Repeated reading represents a well-known example of FBPC: students read aloud a brief passage with a goal of increasing the frequency of correct words read per minute (National Reading Panel, 2000; Therrien, 2004). Behavioral fluency researchers have successfully used FBPC procedures for interventions in reading (Hughes, Beverley, & Whitehead, 2007; Kubina, Amato, Schwilke, & Therrien, 2008; Brown, Dunne, & Cooper, 1996), spelling (Kubina, Young, & Kilwein, 2004) mathematics (Binder, Haughton, & Van Eyk, 1990; Brady & Kubina, 2010) and advanced writing (Dermer, Lopez, & Messling, 2009). Using FBPC with different writing skills such as simple sentence construction may also yield similar positive results.

Present Study

The research does not have many interventions imparting accurate, fluent simple sentence construction for students with behavioral concerns. Students with behavioral concerns, such as students with EBD, stand a high probability for continued struggles with writing in absence of intervention. To address needs in the research for enduring and robust interventions and help

students in need of writing instruction, the present study investigated the efficacy of intervention (SI and FBPC) within the context of an applied research setting using a single-case experimental design.

Applied research can powerfully inform the efficacy of a set of intervention procedures (Johnston & Pennypacker, 2009). Efficacy refers to the experimental effects of an intervention closely controlled by the researchers in coordination with participants and practitioners (Odom, 2009). Many researchers have used single case designs within applied settings (Kennedy, 2005; Kratochwill et al., 2013) to detect a functional relationship between an intervention and dependent measures. Single case designs represent a type of education design research (Smith, Schmidt, Edelen-Smith, & Cook, 2013) that advances scientific understanding through multiple stages of analysis/exploration, design/construction, and evaluation/refinement.

The authors conducted the present study to investigate the efficacy of SI and FBPC intervention procedures, increase theoretical understanding of a writing fluency intervention, and improve a critical writing skill (i.e., sentence construction) for students with behavioral concerns and EBD. The following three experimental questions emerged. First, would the amount of word sequences displaying correct syntax, capitalization, and punctuation improve following intervention? Second, would the amount of simple sentences improve following intervention? Third, would performance maintain across time with minimal to no decrease?

METHODS

Students

Table 1 shows student characteristics. Four elementary-aged students with disabilities and behavioral concerns participated in the study. All students received instruction from a special education teacher within a resource room for part of the school day. Three of the students, Abbott, Bob, and Kelvin, had behavior plans as part of their individualized education plan (IEP). Abbott and Bob received services for comorbid diagnoses of EBD and specific learning disability (SLD). Kelvin, receiving services for SLD, had a behavior plan for self-control and distractibility. Ray received services for comorbid diagnoses of autism and speech language impairment. Ray did not have a documented behavior plan but his teachers reported problems with his ability to follow directions and express anger appropriately.

TABLE 1
Student Demographic Information

<i>Name</i>	<i>Grade</i>	<i>Age</i>	<i>Race</i>	<i>Sex</i>	<i>Standardized Assessment</i>
Abbott	4	10.6	White	Male	DRA: 24, Brigance oral reading: 3.5
Kelvin	5	11.2	White	Male	Brigance oral reading: 3.5
Ray	4	9.8	Asian	Male	DRA: 40
Bob	4	10.2	White	Male	N/A

Note. Standardized assessment results were taken from special education records. DRA = developmental reading assessment.

Intervention and assessment materials were written at an approximate second to third grade readability level. In order to ensure participants did not struggle to decode materials, a review of pre-existing academic records provided reading assessment data for three of the four participants (i.e., everyone except Bob). Bob's teachers informally reported that Bob displayed reading performance comparable with his typically developing peers. The developmental reading assessment (DRA; Beaver, 1997) correlates student scores to a leveled system of text passages and books ranging in scale from A to 44. According to the DRA level scale, Abbott displayed accurate and independent reading performance with text written at approximately a second to third grade readability. Ray's DRA level showed accurate and independent reading with text of approximate fourth grade readability. Using the *Brigance Diagnostic Comprehensive Inventory of Basic Skills* (Brigance, 1999), Kelvin and Abbott displayed accuracy with text written at a readability of a 3.5 grade level.

Setting

Intervention occurred across two elementary schools in a suburban area on the east coast. Within each school, teachers worked one-on-one with students in a resource room or empty hallway. Inside the resource rooms, intervention occurred in unoccupied instructional centers; students sat at a desk while the teacher provided instruction standing in front of the student or sitting by an adjacent desk. When intervention occurred in the hallway, teachers sat adjacent to students at a desk in a quiet area.

Materials

Sentence Construction Assessments

The formatting of sentence construction assessments was similar to the writing fluency subtest of the *Woodcock-Johnson III Test of Achievement* (WJ-III; Woodcock, McGrew, & Mather, 2001) with several slight differences. Each assessment had 10 items across two pages. Each item had a small picture of a person, animal, or object engaged in an activity with word prompts. One word prompt named the person, animal, or object in the picture, and the other word prompt provided a verb or object describing the activity. Word prompts ranged between two to three words. For instance, a small picture showed a child riding a skateboard in the street with the prompts: "the child" and "street" accompanying it. To the right of each picture, students constructed a sentence on two blank lines. Each unique picture did not repeat across items or material sets. In other words, the experimenters controlled for overlap in pictures between materials used for assessment and intervention. Pictures came from clip-art websites and a commercially available curriculum (Engelmann & Silbert, 2005).

SI and FBPC

Materials for SI featured pictures with word prompts and simple sentences (complete and incomplete). SI entailed three different stimulus sets, one for each instructional session. The first author created complete and incomplete sentences and copied text from basal readers. Using the Spache readability formula (Ardoin, Williams, Christ, Klubnik, & Wellborn, 2010;

Burke & Greenberg, 2010), the text had an approximate decoding level of second to third grade.

FBPC had 15 different stimulus sets, similar in appearance to sentence construction assessments. Each set had 10 items across two pages. An item was a picture depicting one object (i.e., person, animal, or thing) engaged in an activity with word prompts. Word prompts named the object and provided a verb or object to use during construction. Students constructed simple sentences on two blank lines to the right of each picture.

Dependent Variables

The first dependent variable was the frequency of word sequences per one-min, correct word sequences (CWS) and incorrect word sequences (IWS). The experimenters scored a CWS when sentences began with a capital letter, ended with a punctuation point, and between grammatically correct words. Grammatically correct words were adjacent words that made semantic and syntactic sense, used consistent verb tense, and agreed in number as singular or plural. An IWS score entailed all instances where sentences began with a lower case letter, did not end with a punctuation mark, and between grammatically incorrect words. Grammatically incorrect words did not make semantic sense, had inconsistent verb tense, or did not show singular or plural agreement. Table 2 shows examples of CWS and IWS. Unlike prior studies (e.g., Amato & Watkins, 2011) spelling of words did not count as CWS or IWS because the intervention did not address spelling.

The second dependent variable was the frequency or rate of simple sentences, complete and incomplete, per one-min. Complete sentences started with a capital letter, ended with a punctuation mark, had at least one subject and one verb, and made syntactic and semantic sense (Bui, Schumaker, & Deshler, 2006). Incomplete sentences contained one or more of the following errors: sentence began with a lower case letter, lack of a punctuation mark at the end of the sentence, did not contain at least one subject and one verb, and failed to make syntactic or semantic sense. Table 2 shows examples scored for complete and incomplete sentences. The frequency of simple sentences allowed the experimenters to distinguish between complete and incomplete sentences, but it remained less sensitive to growth compared to word sequences (Parker, McMaster, & Burns, 2011). For example, an incomplete sentence may contain only 1 IWS but have 20 CWS.

To observe word sequences and sentences per one-min, students completed a sentence construction assessment at the end of each daily session. The teacher started each assessment

TABLE 2
Example of Responses Scored for Simple Sentences (Complete and Incomplete)
and Word Sequences (Correct and Incorrect)

<i>Scores</i>	<i>Responses</i>
CWS = 8, IWS = 0 Complete sentence	^ Bobby ^ hid ^ from ^ a ^ ghost ^ and ^ monster ^.
CWS = 3, IWS = 4. Incomplete sentence	x bobby x hide x from ^ a x and ^ monster ^.

by saying “Write as many sentences as you can in one-min, work quickly and accurately.” The teacher provided no further prompting or feedback. Each sentence construction assessment featured 10 items, more than possible to complete in one-min. Students potentially completed a different amount of items on each assessment (e.g., five items on Assessment A, seven items on Assessment B, eight items on Assessment C, etc.). Experimenters did not require students to complete a fixed amount of items on assessment (e.g., always completing 10 items on Assessments A to C). The differing amount of items completed meant frequency of correct and incorrect responses progressed in similar or divergent fashion. Similar frequencies occurred when both correct and incorrect responses increased or both decreased. The frequencies diverged when one increased but the other decreased.

Accuracy of Dependent Variables

Accuracy describes the extent to which observed values estimate the events that took place in an experiment (Johnston & Pennypacker, 2009). The first author taught observation of both dependent variables to two observers naïve to the purpose of the study. The first author created and scored 50 example sentences and these scores became the true value. The true value represents a score or value that involves the highest degree possible to minimize measurement error (Johnston & Pennypacker, 2009). Instruction for the raters ended when their observed values achieved at least 95% accuracy with the true values.

The observers received assessments via fax or email from the teachers following each intervention session. One observer scored assessments for both dependent variables. The other observer scored 33% of the assessments, randomly selected across all students and phases for calibration. Using exact agreement, the number of agreements divided by the total number of agreement and disagreement multiplied by 100, calibration achieved a mean of 93% accuracy for both dependent variables.

Experimental Procedures

Teachers

Three special education teachers delivered intervention to the four students meeting inclusion criteria. Muzone delivered intervention to Abbott and Kelvin. Muzone had more than 13 years of teaching experience across elementary and middle school grades. His teaching experience mainly included students with mild to moderate disabilities. Denise delivered intervention to Bob. Denise worked as a special education teacher for seven years, instructing a wide range of students with disabilities including, EBD, SLD, and autism. Bettie was the teacher for Ray. Bettie served as a special education teacher for one year where she worked in a resource room, providing instruction to elementary aged students in grades first to fifth.

Procedural Integrity

To establish procedural integrity, the first author led an instructional session on protocols for intervention and assessment for all three participating teachers. The teachers delivered intervention and assessments procedures from a script. The instructional session continued

until all teachers performed the script with 100% accuracy. Instructors also scored example responses for CWS and IWS until reaching a minimum of 95% accuracy with true values.

To monitor procedural integrity, teachers recorded all intervention and assessment sessions using a computer-recording device. Teachers posted audio files onto a shared electronic workspace and faxed or emailed assessments following each session. The first author listened to audio files daily, viewed assessments, and provided feedback as needed. While listening to the audio files and viewing faxed/mailed documents, the author completed a procedural checklist looking for appropriate teacher modeling, prompting, duration of timed practice, and independent assessment of student performance. Procedural fidelity was 100% across teachers and experimental phases.

Setting a Performance Criterion

A performance criterion for FBPC of simple sentence construction has not previously appeared in the literature. To determine the performance criterion, the Director of Special Education at the participating school district administered a one-min sentence construction assessment to 10 elementary-aged students who passed the statewide assessment of writing. Administration of the assessment followed the procedures described in the dependent variable section of this study. Experimenters scored assessments for CWS and IWS. CWS and IWS falling at the 75th percentile served as the performance criterion, 30 CWS with a maximum of 3 IWS. Setting the performance criterion at the 75th percentile sought to promote high levels of performance during intervention and maintenance. Additionally, achieving the performance criterion during intervention would increase the likelihood that participating students would succeed within a classroom of their high-performing peers.

Student Selection

Selection of students followed four steps. First, teachers nominated students receiving special education services who had problems with sentence construction. Second, students had to display at least a third grade reading decoding level in order to benefit from instruction. Third, students had to score below the performance criterion on an assessment of sentence construction. Fourth, students had to display fluent handwriting, within the range of 80 to 100 correct letters per minute on a sentence copy task. The handwriting fluency range came from the approximate amount of letters needed to reach the performance criteria of 30 CWS.

Baseline

During each baseline session, all students completed a one-min sentence construction assessment in their resource classroom. The experimenters graphed the assessment data on a daily basis to decide which student would enter the intervention phase. As a decision rule, a single student began intervention following either a stable baseline or a decreasing trend of CWS and/or increasing trend of IWS. Upon successful completion of the SI portion of intervention, experimenters selected another student to receive intervention.

During baseline only one student, Bob, received additional writing instruction within the special education resource room. Bob's sessions lasted approximately 30 to 40 min, three times a week, and covered composition and the writing process of planning, writing, and revising.

TABLE 3
Number of Sessions, Description, and Decision Rules of Experimental Phases

<i>Experimental Phase</i>	<i>Number of Sessions</i>	<i>Description and Decision Rules</i>
Baseline	4 to 12	Students participated in their typical classroom activities. One student at time entered intervention following a stable baseline or either a declining trend in CWS and/or increasing trend of IWS.
Intervention part 1: SI	3	Three instructional lessons on constructing simple sentences were delivered. Students needed to score at least 90% on assessment to proceed to FBPC.
Intervention part 2: FBPC	Maximum of 15	Each session had three, one-min. timed trials. Intervention finished upon achieving the performance criterion or following 15 sessions, whichever first happened.
Maintenance	2 to 3	Assessment occurred 10, 20, and 30 days following completion of intervention.

Note. SI = sentence instruction; FBPC = frequency building to a performance criterion; CWS = correct word sequences; IWS = incorrect word sequences.

The other three students, Abbott, Kelvin, and Ray, received assistance from their special education teacher or paraprofessional on writing assignments within the general education classroom. The teacher for Abbott and Kelvin reported that writing instruction typically lasted approximately 30 minutes each day and focused on paragraph composition, editing, and grammar/usage. Ray's teacher, Bettie, reported that their class usually focused on handwriting, spelling, and the writing process of planning, writing, and revising.

SI and FBPC

During the SI and FBPC phase, students worked individually with their teacher. SI and FBPC had a total of 18 possible sessions. The first three sessions were the SI component and sessions four to eighteen were the FBPC component of intervention. Table 3 lists the number of sessions, description of phases, and decision rules of experimenters.

Sessions one to three. The first three sessions lasted approximately 25-min each. Teachers delivered instruction from scripted lessons created by the first author. The scripts included model-lead-test instructional formats (Archer & Hughes, 2011) and required teachers to model each new skill, lead students through guided practice, provide immediate error correction, and test for acquisition. Immediately following an error, the teachers vocally stated the correct response and students repeated.

During session one, the teachers introduced simple sentences as an important skill needed for clear written expression. A complete, simple sentence contained two main parts, one part that names someone or something and a second part that tells more. Incomplete sentences had one of the two main parts missing. Students read aloud complete and incomplete sentences that accompanied a picture. As an example, a picture showed individuals at a beach playing volleyball. Sentences below the picture described the activities. Using the definition of simple sentences as two main parts, one part that names someone or something and a second part that

tells more, students orally identified complete and incomplete sentences and fixed incomplete sentences by transcribing the missing main part.

During session two, students identified both parts of a simple sentence in a collection of sentences. In contrast to session one, sentences did not correspond to a picture. Students read aloud a series of phrases and orally identified each phrase as a complete or incomplete sentence. Students also filled in missing capitalization and/or punctuation.

In session three, students viewed a collection of small pictures depicting a single item (i.e., person, animal or thing) engaged in an activity. Pictures also included word prompts: the name of the subject and a verb or object. Using the word prompts, students constructed a simple sentence for each picture. Students had to achieve at least 90% accuracy on the first three sessions to proceed to session four. If accuracy fell below 90%, then students repeated the session(s).

Sessions four to eighteen. Sessions four to eighteen featured FBPC. Each session lasted approximately eight-min. Students completed three, one-min timed trials each session. The same set of materials was used for all three timings (e.g., three copies of sheet 1), but materials changed across sessions (e.g., three copies of sheet 1 on Monday, three copies of sheet 2 on Tuesday, etc.). Teachers began each timed trial by saying, "You have one-min to write as many sentences as you can. Work quickly and accurately." In between timings, teachers scored responses for the amount of word sequences, CWS and IWS, and corrected errors. Teachers delivered performance feedback by stating corrections and having students repeat the correction. Teachers praised students for constructing sentences containing both parts and encouraged students to reach the performance criterion. The intervention phase continued until students achieved the performance criterion, at least 30 CWS with 0 to 3 IWS on the majority of timings for three days, or following session 18, whichever occurred first.

Experimental Design and Data Analysis

The present study used a single case experimental design, a multiple baseline across participants, to detect a functional relation between independent and dependent variables (Kazdin, 2011; Kennedy, 2005). The multiple baseline design provided several opportunities to replicate experimental effects and controlled for history and maturation effects. Experimenters visually analyzed data for trend, level, and overlap (Kennedy, 2005) and included several supplements to aid judgment: mean performance by participants across phases, percentage of nonoverlapping data (PND), trend lines, celeration values, and the Standard Celeration Chart (SCC).

PND (Scruggs & Mastropieri, 2001) shows the percentage of data points between experimental phases not sharing overlap, providing a metric to gauge immediate and enduring effects of intervention. PND benefits from popularity among researchers (Scruggs & Mastropieri, 2013) and is commonly reported in studies and meta-analyses of single case research. However, several limitations exist with PND to serve as a primary or sole metric of effect. These limitations include insensitivity to changes in mean or trend across experimental phases (Datchuk & Kubina, 2011; Wolery, Busick, Reichow, & Barton, 2010). To address these limitations, mean performance over time was reported. Additionally, segments of the SCC displayed trend lines and celeration values to provide a measure of trend or slope.

Rationale for the SCC and Celeration

Within single case designs, experimental effects occur from detection of large, discernible changes in dependent variables (Baer, 1977; Cooper, Heron, & Heward, 2007; Lindsley, 2010; Parsonson & Baer, 1978, 1986; Sidman, 1960). To help recognize and quantify significant change, the experimenters displayed data from sentence construction assessments on four tiers taken from the Standard Celeration Chart (Pennypacker, Gutierrez, Lindsley, 2003). The SCC presents discernible changes as proportional (Graf & Lindsley, 2002) along a semilogarithmic axis. Rulings along the vertical axis maintain proportionality. As an example, moving from one to two has the same amount of chart space as going from two to four because both result in a mathematic doubling (Schmid, 1986).

Additionally, the SCC allows chart readers to quantify change measures thus seeing trend visually and expressed as a value (i.e., a doubling or tripling of performance represented as $\times 2.0$ or $\times 3.0$). A unit of measurement known as celeration quantifies the trend or rapidity of change (Johnston & Pennypacker, 2009; Kubina & Yurich, 2012; Pennypacker et al., 2003). The experimenters first calculated trend lines using the split-middle technique (White, 1974), then quantified the trends into celeration values. For example, a trend line rising from four to eight across eight calendar days equals a doubling in proportion or a celeration value multiplying by two—reported as a value with the time unit: $\times 2.0$ [8 days] (Kubina & Yurich, 2012). A trend line falling from four to two across eight calendar days equals a halving in speed or a celeration value dividing by two: $\div 2.0$ [8 days]. Each celeration value also tells the chart reader the percentage of change. A $\times 1.4$ [7 days] means the behavior grew by 40% whereas a $\times 1.05$ [7 days] communicates a 5% weekly growth.

RESULTS

The results section has two main components: word sequences (CWS and IWS) and simple sentences (complete and incomplete) per one-min. Figure 1 displays the frequency of CWS and IWS. Figure 2 shows the frequency of complete and incomplete simple sentences. On their respective figures, dots indicate CWS and complete sentences, and Xs indicate IWS and incomplete sentences. Celeration lines show direction and speed of performance change within each phase. Celeration values for each phase appear to the right of both figures. Table 4 shows the mean performance of word sequences and simple sentences per one-min across experimental phases.

CWS and IWS

Baseline

Baseline sessions ranged in duration from 6 (Abbott) to 23 (Kelvin) calendar days. Baseline had the lowest level or mean of CWS and highest level of IWS across students, meaning students produced low amounts of written output and showed low accuracy. For all students, celeration values of CWS remained flat or accelerated at a slower rate than IWS, meaning speed and accuracy of word sequences remained flat or worsened for all students. For example, Ray's performance during baseline showed a flat celeration or trend for CWS $\times 1.0$ [17 days] but an

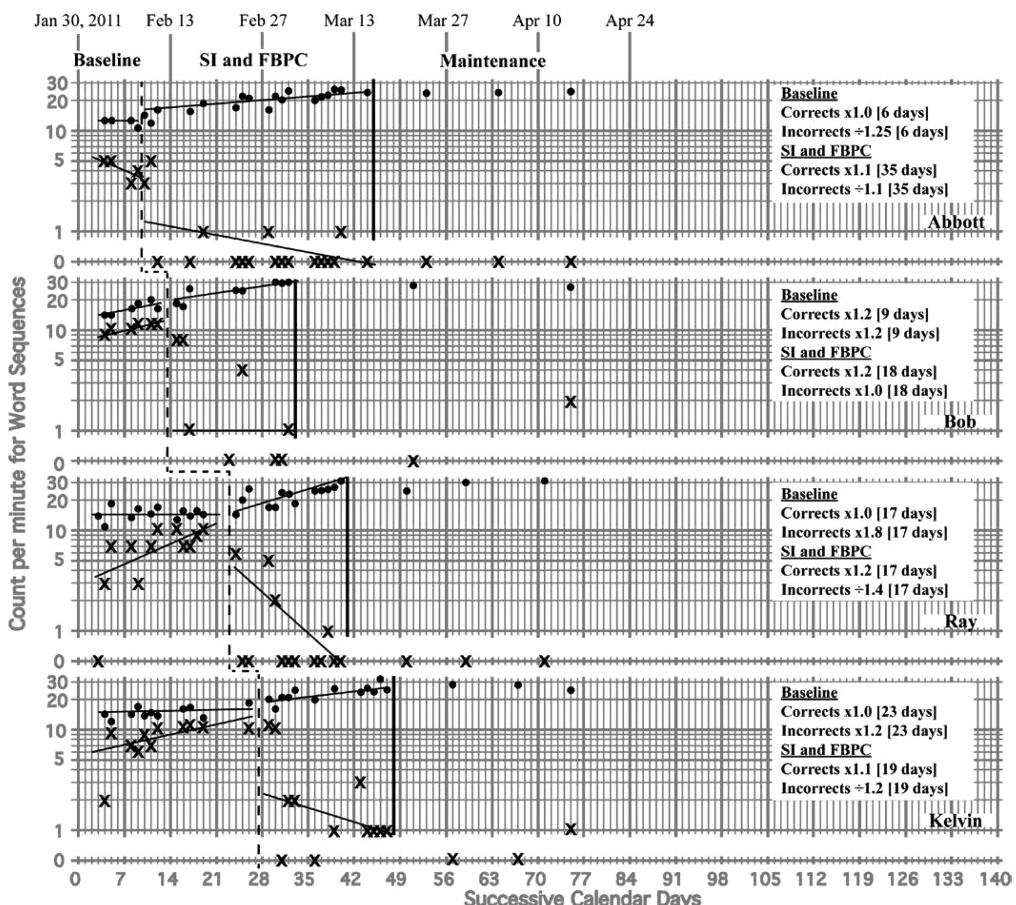


FIGURE 1 Frequency of correct and incorrect word sequences per 1-minute across consecutive calendar days. SI and FBPC = sentence instruction and frequency building to a performance criterion. Dots are correct words sequences. Xs are incorrect word sequences.

accelerating trend for IWS $\times 1.8$ [17 days]. Abbott showed a decelerating rate of IWS $\div 1.25$ [6 days], but his CWS $\times 1.0$ [6 days] showed no improvement in frequency of responding.

Intervention and Maintenance

The SI and FBPC intervention phase ranged from 17 (Ray) to 35 (Abbott) calendar days. Each student completed the SI component in three instructional sessions. The FBPC component started following the third session and ended when students either achieved the performance criteria on two out of three consecutive days or following session 18, whichever occurred first. All students except Abbott achieved the performance criterion. Bob finished following eight sessions. Ray finished intervention following 13 sessions, and Kelvin finished after 12 sessions.

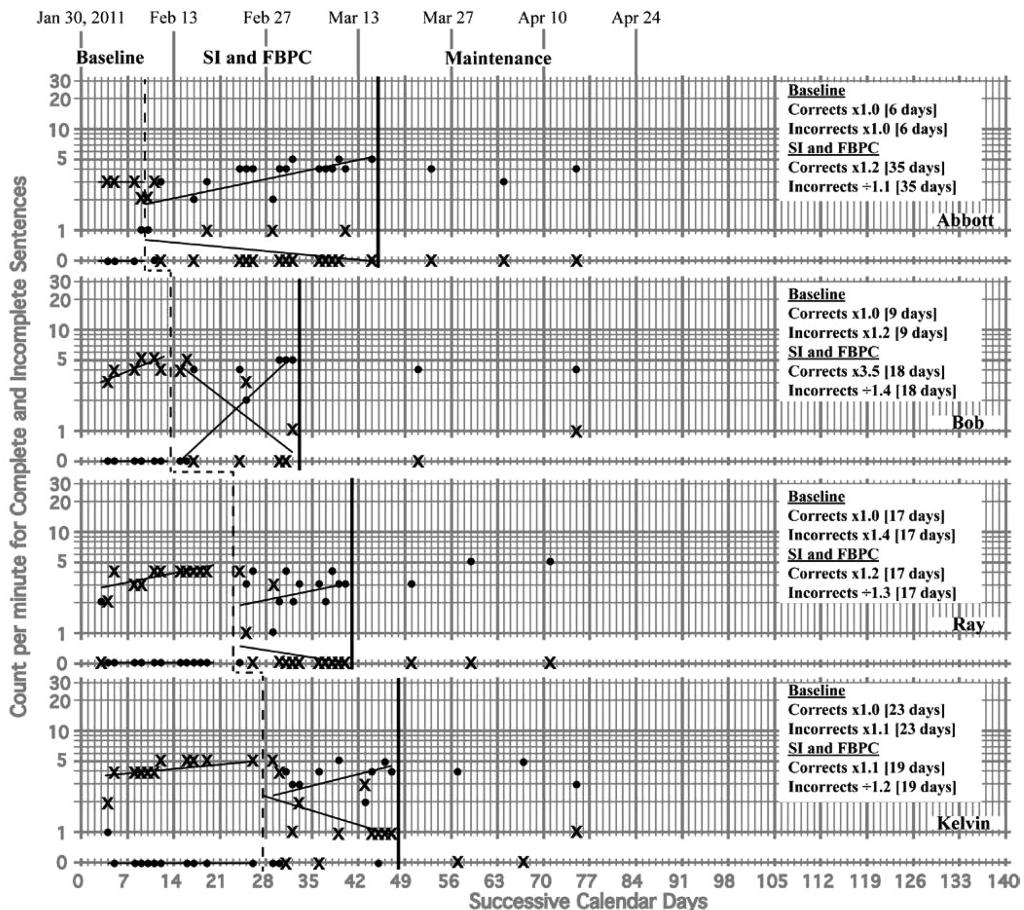


FIGURE 2 Frequency of complete and incomplete sentences per one-minute across consecutive calendar days. SI and FBPC = sentence instruction and frequency building to a performance criterion. Dots are complete sentences. Xs are incomplete sentences.

Across students, the level of CWS did not immediately change from baseline. All students gradually increased speed and accuracy of responses. Celeration values show CWS accelerated gradually and IWS decelerated. For example, celeration values for Abbott's performance indicated an increasing trend for CWS $\times 1.1$ [35 days] and a decreasing trend for IWS $\div 1.1$ [35 days].

Students completed a total of three maintenance timing approximately 10, 20, and 30 days following completion of the SI and FBPC phase. Due to scheduling conflicts Bob completed only two maintenance timings on days 20 and 30. All students displayed their highest level of CWS and lowest level of IWS during maintenance.

The PND of both intervention and maintenance phases for CWS ranged from 75% (Ray) to 95% (Abbott). IWS ranged from 67% (Kelvin) to 100% (Bob). CWS had an overall PND

TABLE 4
Mean Word Sequences (Correct and Incorrect) and
Sentences (Complete and Incomplete) Over Time

Student	Phase	Word Sequences		Sentences	
		CWS	IWS	Comp.	Incomp.
Abbott	Baseline	12.5	4.3	0.25	2.75
	SI and FBPC	20.3	0.6	3.4	0.4
	Maintenance	24	0	3.7	0.3
Bob	Baseline	17	11.2	0	4.2
	SI and FBPC	24.3	3.3	2.8	1.9
	Maintenance	27.5	1.5	4	0.5
Ray	Baseline	15.1	6.7	0.2	3.3
	SI and FBPC	22.9	1.1	2.6	0.6
	Maintenance	28.7	0	4.3	0
Kelvin	Baseline	15.5	8.5	0.1	4.3
	SI and FBPC	23.5	2.8	2.8	1.7
	Maintenance	27	0.3	4	0.3

Note. SI = sentence instruction; FBPC = frequency building to a performance criterion; CWS = correct word sequences; IWS = incorrect word sequences; Comp. = complete sentences; Incomp. = incomplete sentences.

of 87%, and IWS had 85%. Taken with changes in trend, shown by trend lines and celeration values, intervention and maintenance showed clear separation with little overlap to baseline.

Complete and Incomplete Sentences

Baseline

Students showed very low accuracy during baseline. On the vast majority of days, incomplete sentences outnumbered complete sentences. Baseline had the lowest level or mean of complete and highest level of incomplete sentences. As indicated by celeration values the speed of incomplete sentences accelerated at an equal or greater rate compared to complete sentences, meaning performance remained stable or worsened over time. Indicative of the worsening performance, the frequency of Ray's incomplete sentences accelerated upward $\times 1.4$ [17 days] but the trend for complete sentences remained flat $\times 1.0$ [17 days].

Intervention and Maintenance

Similar to effects on word sequences, the intervention phase led to gradual increases in speed and accuracy for the majority of participants. Celeration values of complete and incomplete sentences showed gradual separation of data paths for Abbott, Ray, and Kelvin. Illustrative of this pattern, Kelvin's frequency of complete sentences accelerated upward $\times 1.1$ [19 days], and incomplete sentences trended downward $\div 1.2$ [19 days]. Bob showed a rapid separation between data paths with a steep upward trend of complete sentences, $\times 3.5$ [18 days], and a downward trend of incomplete sentences, $\div 1.4$ [18 days]. The rapid separation shows Bob's

performance quickly improved during intervention. The majority of participants also showed overlap between complete and incomplete sentences, overlapping one or two days for Bob, Kelvin, and Ray.

All students displayed performance during maintenance comparable or higher to the SI and FBPC phase. Bob, Ray, and Kelvin displayed their quickest and most accurate scores. Abbott showed highly accurate scores but slightly decreased from the end of the intervention phase. Overall scores indicate students maintained fluent simple sentence construction following completion of the intervention.

The PND for complete sentences during intervention and maintenance ranged from 69% (Ray) to 90% (Abbott). Incomplete sentences were 0% (Ray) and 90% (Abbott). Overall, the PND for complete sentences was 80%, and incomplete sentences showed 60%. These scores suggest intervention and maintenance showed little to moderate overlap to baseline.

DISCUSSION

A need exists for sentence construction interventions for elementary-aged students with behavioral concerns and EBD. The EBD population remains at a high likelihood for sustained writing difficulty without intervention (Brier, 1995; Scruggs & Mastropieri, 1986; Trout et al., 2003). Construction of simple sentences represents a core skill for more advanced writing tasks such as complex sentences, paragraphs, and multiparagraph composition. The present study examined the effects of sentence instruction and frequency building to a performance criterion (SI and FBPC) on the frequency of word sequences and simple sentences of elementary-aged students with behavioral concerns and EBD.

Analysis of the results (i.e., visual analysis, PND, celeration values, and mean performance), support a functional relation between intervention and both dependent variables. During intervention, all students increased speed and accuracy of the number of CWS and decreased the number of IWS. All students except Abbott showed an upward trend of IWS during baseline meaning they lacked a proper strategy to consistently construct words with correct syntax, capitalization, and punctuation. Abbott did not have an acceleration of IWS during baseline, however he displayed a stable, flat trend of CWS below the performance criterion of high performing writers in his school. Following intervention, Abbott and the other three participating students showed increases in celeration and mean of CWS and concurrent decelerations in IWS. Displayed concurrently, separation between CWS and IWS during intervention shows a clear benefit from intervention. Overall PND metrics for CWS (87%) and IWS (85%) also suggest a moderate effect.

During the SI and FBPC phase, all students showed increased speed and accuracy in the number of complete sentences and decreases in the amount of incomplete sentences. Specifically, for all students the celeration values and mean of complete sentences during intervention exceeded the values displayed in baseline; a range of $\times 1.1$ to $\times 1.2$ or a 10 to 20% weekly gain as a result of the intervention. Performance frequencies for SI and FBPC phase show a clear separation between complete sentences and incomplete sentences. The accelerating rate of complete sentences and decelerating rate of incomplete sentences shows the positive effects of intervention on construction of simple sentences. The overall PND scores for complete sentences (80%) and incomplete sentences (60%) suggest a low to moderate effect of interven-

tion. The low PND score for incomplete sentences was influenced by an increasing trend in baseline for Ray, as shown in Figure 2. Contrary to the low PND score, trend lines and celeration values show a clear and substantial change in trend for Ray; incomplete sentences increased in trend during baseline, $\times 1.7$ (17 days) then decreased during intervention, $\div 1.3$ (17 days).

Results from the present study suggest SI and FBPC is a promising intervention to improve writing and prevent continued difficulty for elementary-aged students with behavior concerns and EBD (Berninger et al., 2002, 2006). Previous sentence construction studies have used picture-word prompts as part of intervention to teach simple sentences construction (Anderson & Keel, 2002; Viel-Ruma et al., 2010; Walker et al., 2005). The use of picture and word prompts for assessment of sentence construction is already a commonly accepted practice by researchers and practitioners, as shown by the widespread use of the *Writing Fluency Subtest* on the WJ-III; (Woodcock et al., 2001). In the present study, picture-word prompts limited the range of possible responses by students and allowed teachers to systematically teach and assess sentence construction. Also, the prompts potentially eased task demands of acquiring simple sentence construction by replacing content generation with picture description. The inclusion of picture-word prompts reduced the need to generate content and required writers to construct sentences describing the pictures.

In addition to extending the sentence construction literature, the findings contribute to the literature of interventions designed to produce fluency. Fluency, measured as a frequency criterion, serves as an important academic outcome promoting proximal and distal behavior change (Binder, 1996; Codding & Poncy, 2010; Mason & Kubina, 2011). The theory of behavioral fluency (Binder, 1996; Kubina & Morrison, 2000) suggests fluent behavior promotes immediate improvement that maintains across time with little to no performance decrement.

The present results support the durable behavior fostered by fluency. Namely, the students maintained fluent behaviors of word sequences and complete sentences at a rate comparable to those during intervention. All students except Abbott displayed their highest level of both CWS and complete sentences 10, 20, and 30 days following completion of FBPC. Abbott showed increases in CWS but had a slight increase in incomplete sentences. This finding may partially stem from differences in complexity and sensitivity of complete sentences and CWS. A complete simple sentence is a more complex response with a single simple sentence requiring more output than a single word sequence. Previous research (McMaster et al., 2011; Parker et al., 2011) also suggests CWS can detect small changes in linguistic growth better than sentence length measures.

Overall results suggest intervention produced enduring change in writing behavior, supporting the efficacy of intervention. Furthermore, the teachers implemented the package of SI and FBPC with limited support. The importance of having teachers apply a sophisticated set of procedures with high fidelity demonstrates the utility of the intervention procedures. The resulting increases in speed and accuracy of CWS and complete sentences along with high degrees of maintenance suggest the present study had an educationally significant impact for the four students who participated.

Limitations

Researchers did not collect information from teachers or students regarding perceived social validity of the intervention (Kennedy, 1992, 2005). Social validity measures may provide val-

able feedback on implementing potentially complex intervention procedures and acceptability of procedures from both teachers and students (Strain, Barton, & Dunlap, 2012). Additionally, social validity measures may inform how much students and teachers value the outcomes resulting from intervention.

Future Directions

The experimental design, single-case multiple baseline across participants, allowed detection of a functional relation between intervention and writing behavior. Results from the present study suggest that special education teachers can efficiently and effectively deliver intervention to students with behavioral concerns and EBD but the experimental design did not specifically test generality of findings to the larger population of students with EBD. Future research could continue to expand the intervention to include larger samples of the intended population.

The present study employed a broad definition of behavioral concerns given the applied research context and reliance on teacher nomination of students. For example, Abbott and Bob received services for EBD but Ray was referred by teachers as displaying challenging behavior in the classroom. Future research can investigate the efficacy of intervention with a more homogenous sample of students with behavioral concerns. A more homogenous sample could extend scientific understanding of experimental effects to specific subsets of students with behavioral concerns including students with EBD.

Future research should also expand the sample used to determine a performance criterion for CWS and IWS per one-min. Researchers in the present study collected writing samples from a small number of students within the same school district to set a local performance criterion. Increasing the number of writing samples may increase generality of the performance criterion to other students and populations.

Also, the present study lacked experimental phases designed to intervene and measure closely related writing skills such as paragraph composition or spelling. Fluency in multiple sentence level writing skills should impact development of closely related writing skills (Datchuk & Kubina, 2012; Graham et al., 2012). Fluent sentence construction skills should promote use of simple sentences within paragraph compositions and provide opportunities to improve spelling. Future research should include additional experimental phases to teach closely related skills and assess for application to related skills, such as by including incorrect or correct spelling of words within CWS measures (McMaster et al., 2011).

Lastly, effects of intervention to increase performance on typical classroom writing assignments are unknown. Future research should expand intervention to measure effects on typical writing assignments, such as composing short narratives or persuasive essays. Investigating these effects may potentially increase the usefulness of intervention and allow practitioners to judiciously plan for additional instruction and intervention needed for a comprehensive writing program.

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REFERENCES

- Abbott, R. D., Berninger, V. W., & Fayol, M. (2010). Longitudinal relationships of levels of language in writing and between writing and reading in grades 1 to 7. *Journal of Educational Psychology, 102*, 281–298.
- Amato, J. M. & Watkins, M. W. (2011). The predictive validity of CBM writing indices for eighth-grade students. *The Journal of Special Education, 44*, 195–204.
- Anderson, D. M. & Keel, M. C. (2002). Using reasoning and writing to teach writing skills to students with learning disabilities and behavioral disorders. *Journal of Direct Instruction, 2*(1), 49–55.
- Archer, A. & Hughes, C. (2011). *Explicit instruction: Efficient and effective teaching*. New York: Guilford Publications.
- Ardoian, S. P., Williams, J. C., Christ, T. J., Klubnik, C., & Wellborn, C. (2010). Examining readability estimates' predictions of students' oral reading rate: Spache, lexile, and forecast. *School Psychology Review, 39*, 277–285.
- Baer, D. M. (1977). Reviewer's comment: Just because it's reliable doesn't mean that you can use it. *Journal of Applied Behavior Analysis, 10*, 117–119.
- Beaver, J. (1997). *Developmental reading assessment*. Glenview, IL: Celebration Press.
- Berninger, V., Cartwright, A., Yates, C., Swanson, H. L., & Abbott, R. (1994). Developmental skills related to writing and reading acquisition in the intermediate grades: Shared and unique variance. *Reading and Writing: An Interdisciplinary Journal, 6*, 161–196.
- Berninger, V. W., Rutberg, J. E., Abbott, R. D., Garcia, N., Anderson-Youngstrom, M., Brooks, A., & Fulton, C. (2006). Tier 1 and tier 2 early intervention for handwriting and composing. *Journal of School Psychology, 44*(1), 3–30. doi:10.1016/j.jsp.2005.12.003.
- Berninger, V. W., Vaughan, K., Abbott, R. D., Begay, K., Coleman, K. B., Curtin, G., Hawkins, J. M., & Graham, S. (2002). Teaching spelling and composition alone and together: Implications for the simple view of writing. *Journal of Educational Psychology, 94*(2), 291–304. doi:10.1037/0022-0663.94.2.291.
- Berninger, V., Yates, C., Cartwright, A., Rutberg, J., Remy, E., & Abbott, R. (1992). Lower-level developmental skills in beginning writing. *Reading and Writing: An Interdisciplinary Journal, 4*, 257–280.
- Binder, C. (1996). Behavioral fluency: Evolution of a new paradigm. *The Behavior Analyst, 19*, 163–197.
- Binder, C. (2005). Behavioral fluency. In M. Hersen, G. Sugai, & R. Horner (Eds.), *Encyclopedia of behavior modification and cognitive behavior therapy: Education applications* (Vol. 3, pp. 1185–1188). Thousand Oaks, CA: Sage.
- Binder, C., Haughton, E., & Van Eyk, D. (1990). Increasing endurance by building fluency: Precision teaching attention span. *Teaching Exceptional Children, 22*, 24–27.
- Brady, K. K. & Kubina, R. M. (2010). Endurance of multiple fact fluency for students with attention deficit hyperactivity disorder. *Behavior Modification, 34*, 79–93.
- Brier, N. (1995). Predicting antisocial behavior in youngsters displaying poor academic achievement: A review of risk factors. *Journal of Developmental & Behavioral Pediatrics, 16*, 271–276.
- Brown, S. A., Dunne, J. D., & Cooper, J. O. (1996). Immediate retelling's effect on student retention. *Education & Treatment of Children, 19*, 387–407.
- Bui, Y. N., Schumaker, J. B., & Deshler, D. D. (2006). The effects of a strategic writing program for students with and without learning disabilities in inclusive fifth-grade classes. *Learning Disabilities Research & Practice, 21*, 244–260. doi:10.1111/j.1540-5826.2006.00221.x.
- Brigance, A. H. (1999). *Brigance diagnostic comprehensive inventory of basic skills—Revised (CIBS-R)*. North Billerica, MA: Curriculum Associates.
- Burke, V. & Greenberg, D. (2010). Determining readability: How to select and apply easy-to-use readability formulas to assess the difficulty of adult literacy materials. *Adult Basic Education and Literacy Journal, 4*, 34–42.
- Coddington, R. S. & Poncy, B. C. (2010). Introduction to the special issue: Toward an explicit technology for generalizing academic behavior. *Journal of Behavioral Education, 19*, 1–6.
- Common Core State Standards: National Governors Association Center for Best Practices, Council of Chief State School Officers (2010). Retrieved October 1, 2011 from <http://www.corestandards.org>.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). Upper Saddle River, NY: Pearson Prentice.
- Datchuk, S. M. & Kubina, R. M. (2011). Communicating experimental findings in single case design research: How to use celeration values and celeration multipliers to measure direction, magnitude, and change of slope. *Journal of Precision Teaching & Celeration, 27*, 3–17.

- Datchuk, S. M. & Kubina, R. M. (2012). A review of teaching sentence-level writing skills to students with writing difficulties and learning disabilities. *Remedial and Special Education*. Advance online publication. doi:10.1177/0741932512448254.
- Dermer, M. L., Lopez, S. L., & Messling, P. A. (2009). Fluency training a writing skill: Editing for concision. *The Psychological Record*, 59, 3–20.
- Engelmann, S. & Silbert, J. (2005). *Expressive writing I*. Desoto, TX: SRA/McGraw-Hill.
- Graf, S. & Lindsley, O. (2002). *Standard celeration charting 2002*. Youngstown, OH: Graf Implements.
- Graham, S., Berninger, V., Abbott, R., Abbott, S., & Whitaker, D. (1997). The role of mechanics in composing of elementary school students: A new methodological approach. *Journal of Educational Psychology*, 89, 170–182.
- Graham, S., Bollinger, A., Booth Olson, C., D'Aoust, C., MacArthur, C., McCutchen, D., & Olinghouse, N. (2012). *Teaching elementary school students to be effective writers: A practice guide* (NCEE 2012-4058). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, US Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/publications_reviews.aspx#pubsearch.
- Hughes, J. C., Beverley, M., & Whitehead, J. (2007). Using precision teaching to increase the fluency of word reading with problem readers. *European Journal of Behavior Analysis*, 8, 221–238.
- Johnson, K. R. & Layng, T. V. (1992). Breaking the structuralist barrier: Literacy and numeracy with fluency. *American Psychology*, 47(11), 1475–1490.
- Johnson, K. & Street, E. M. (2004). *The Morningside model of generative instruction: What it means to leave no child behind*. Concord, MA: Cambridge Center for Behavioral Studies.
- Johnston, J. M. & Pennypacker, H. S. (2009). *Strategies and tactics of behavioral research*. New York: Routledge.
- Kammeni, E. J. & Simmons, D. C. (1990). *Designing instructional strategies: The prevention of academic learning problems*. Columbus, OH: Merrill.
- Kazdin, A. E. (2011). *Single-case research designs: Methods for clinical and applied settings*. New York: Oxford University Press.
- Kennedy, C. H. (1992). Trends in measurement of social validity. *The Behavior Analyst*, 15, 147–156.
- Kennedy, C. H. (2005). *Single-case designs for educational research*. Boston: Pearson Education.
- Koorland, M. A., Keel, M. C., & Ueberhorst, P. (1990). Setting aims for precision learning. *Teaching Exceptional Children*, 22(3), 64–66.
- Kratochwill, T. R., Hitchcock, J. H., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2013). Single-case intervention research design standards. *Remedial and Special Education*, 34, 26–34.
- Kubina, R. M. (2005). Developing reading fluency through a systematic practice procedure. *Reading and Writing Quarterly*, 21, 185–192.
- Kubina, R. M., Amato, J., Schwilk, C. L., & Therrien, W. J. (2008). Comparing performance standards on the retention of words read correctly per minute. *Journal of Behavioral Education*, 17, 328–338.
- Kubina, R. M., & Morrison, R. S. (2000). Fluency in education. *Behavior and Social Issues*, 10, 83–99.
- Kubina, R. M., Young, A. E., & Kilwein, M. (2004). Examining an effect of fluency: Application of oral word segmentation and letters sounds for spelling. *Learning Disabilities: A Multidisciplinary Journal*, 13, 17–23.
- Kubina, R. M. & Yurich, K. K. L. (2012). *The precision teaching book*. Lemont, PA: Greatness Achieved.
- Lindsley, O. R. (2010). *Skinner on measurement*. Kansas City, MO: Behavior Research Company.
- Mason, L. H., & Kubina, R. M. (2011). Developing writing fluency for adolescents with disabilities. In T. E. Scruggs & M. A. Mastropieri (Eds.), *Assessment and intervention: Advances in learning and behavioral disabilities* (Vol. 24, pp. 295–319). Bingley, UK: Emerald.
- Mason, L. H., Kubina, R. M., Valasa, L. L., & Cramer, A. M. (2010). Evaluating effective writing instruction for adolescent students in an emotional and behavior support setting. *Behavioral Disorders*, 35(2), 140–156.
- McMaster, K. L., Du, X., Yeo, S., Deno, S. L., Parker, D., & Ellis, T. (2011). Curriculum-based measures of beginning writing: Technical features of the slope. *Exceptional Children*, 77, 185–206.
- National Reading Panel (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Washington, DC: National Institute of Child Health and Human Development.
- Nelson, J. R., Benner, G. J., Lane, K., & Smith, B. W. (2004). Academic achievement of K-12 students with emotional and behavioral disorders. *Exceptional Children*, 71, 59–73.
- Odom, S. L. (2009). The tie that binds: Evidence-based practice, implementation science, and outcomes for children. *Topics in Early Childhood Special Education*, 29, 53–61.

- Parker, D. C., McMaster, K. L., & Burns, M. K. (2011). Determining an instructional level for early writing skills. *School Psychology Review, 40*(1), 158–167.
- Parsonson, B. S. & Baer, D. (1978). The analysis and presentation of graphic data. In T. Kratochwill (Ed.), *Single-subject research: Strategies for evaluating change* (pp. 105–165). New York: Academic Press.
- Parsonson, B. S. & Baer, D. M. (1986). The graphic analysis of data. In A. Poling & R. W. Fuqua (Eds.), *Research methods in applied behavior analysis: Issues and advances* (pp. 157–186). New York: Plenum Press.
- Pennypacker, H. S., Gutierrez, A., & Lindsley, O. R. (2003). *Handbook of the standard celeration chart*. Cambridge, MA: Cambridge Center for Behavioral Studies.
- Reid, R., Gonzalez, J. E., Nordness, P. D., Trout, A., & Epstein, M. H. (2004). A meta-analysis of the academic status of students with emotional/behavioral disturbance. *The Journal of Special Education, 38*(3), 130–143.
- Saddler, B., Asaro, K., & Behforooz, B. (2008). The effects of peer-assisted sentence-combining on four young writers with learning disabilities. *Learning Disabilities: A Contemporary Journal, 6*, 17–31.
- Saddler, B., Behforooz, B., & Asaro, K. (2008). The effects of sentence-combining instruction on the writing of fourth-grade students with writing difficulties. *The Journal of Special Education, 42*(2), 79–90. doi:10.1177/0022466907310371.
- Saddler, B. & Graham, S. (2005). The effects of peer-assisted sentence-combining instruction on the writing performance of more and less skilled young writers. *Journal of Educational Psychology, 97*(1), 43–54. doi:10.1037/0022-0663.97.1.43.
- Schmid, C. F. (1986). Whatever happened to the semilogarithmic chart? *The American Statistician, 40*, 238–244.
- Scruggs, T. E. & Mastropieri, M. A. (1986). Academic characteristics of behaviorally disordered and learning disabled students. *Behavioral Disorders, 11*, 184–190.
- Scruggs, T. E. & Mastropieri, M. A. (2001). How to summarize single-participant research: Ideas and applications. *Exceptionality, 9*, 227–244.
- Scruggs, T. E. & Mastropieri, M. A. (2013). PND at 25: Past, present, and future trends in summarizing single-subject research. *Remedial and Special Education, 34*, 9–19.
- Sidman, M. (1960). *Tactics of scientific research*. New York: Basic Books.
- Smith, G. J., Schmidt, M. M., Edelen-Smith, P. J., & Cook, B. G. (2013). Pasteur's quadrant as the bridge linking rigor with relevance. *Exceptional Children, 79*, 147–161.
- Strain, P. S., Barton, E. E., & Dunlap, G. (2012). Lessons learned about the utility of social validity. *Education and Treatment of Children, 35*, 183–200.
- Therrien, W. J. (2004). Fluency and comprehension gains as a result of repeated reading. *Remedial and Special Education, 24*, 252–261.
- Trout, A. L., Nordness, P. D., Pierce, C. D., & Epstein, M. H. (2003). Research on the academic status of children with emotional and behavioral disorders: A review of the literature from 1961–2000. *Journal of Emotional and Behavioral Disorders, 11*, 198–210.
- Viel-Ruma, K., Houchins, D. E., Jolivette, K., Fredrick, L. D., & Gama, R. (2010). Direct instruction in written expression: The effects on English speakers and English language learners with disabilities. *Learning Disabilities Research and Practice, 25*(2), 97–108.
- Walker, B., Shippen, M. E., Alberto, P., Houchins, D. E., & Cihak, D. F. (2005). Using the expressive writing program to improve the writing skills of high school students with learning disabilities. *Learning Disabilities Research & Practice, 20*(3), 175–183. doi:10.1111/j.1540-5826.2005.00131.x.
- White, O. R. (1974). *The split middle a quickie method of trend estimation*. University of Washington, Experimental Education Unit, Child Development and Mental Retardation Center.
- Wolery, M., Busick, M., Reichow, B., & Barton, E. E. (2010). Comparison of overlap methods for quantitatively synthesizing single-subject data. *The Journal of Special Education, 44*, 18–28.
- Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock-Johnson III Tests of Achievement*. Itasca, IL: Riverside Publishing.